

WHAT IS CLAIMED IS:

1. An emboli capturing system for capturing emboli in a body lumen, comprising:

a first elongate member having a proximal end and a distal end;

an expandable emboli capturing device mounted proximate the distal end of the first elongate member, the emboli capturing device being movable between a radially expanded position and a radially retracted position, the expandable emboli capturing device forming a basket with a proximally opening mouth when in the radially expanded position;

a second elongate member having a proximal end and a distal end and a lumen extending between the proximal and distal ends, the lumen being sized to slidably receive a portion of the first elongate member therein; and

an expandable delivery device mounted to the distal end of the second elongate member and being movable from a radially retracted position to a radially expanded position, the delivery device having a receiving end configured to receive the emboli capturing device, the delivery device retaining at least the mouth of the emboli capturing device in the radially retracted position when the delivery device is in the radially retracted position, the emboli capturing device being longitudinally movable out from within the delivery device when the



radially expanded portion of the emboli capturing device; and

a fourth elongate member movable within the lumen of the third elongate member, the fourth elongate member having an intermediate region sized to substantially fill the receiving end and a distal tip having an outer diameter less than an outer diameter of the intermediate region.

6. The emboli capturing system of claim 5 wherein the distal tip of the fourth elongate member is configured with an aperture therein sized to track over the first elongate member.

7. The emboli capturing system of claim 6 wherein the fourth elongate member is formed in a substantially conical shape between the distal tip thereof and the intermediate region thereof.

8. The emboli capturing system of claim 2 wherein the retrieval device includes:

a third elongate member having proximal and distal ends and a lumen extending therebetween, the lumen being sized to slidably receive at least a portion of the first elongate member; and

a mesh sleeve having a first end coupled to the third elongate member, a second end distal of the first end and an intermediate portion between the first and second ends, the mesh sleeve being configured such that relative

longitudinal movement of one of the first and second ends thereof relative to another of the first and second ends thereof drives movement of the mesh portion from a radially retracted position, to a radially expanded position in which the intermediate portion expands radially outward relative to the first and second ends, and to a collapsed position in which the mesh sleeve bends such that the intermediate portion is displaced in a direction toward one of the first and second ends of the mesh sleeve.

9. The emboli capturing system of claim 8 wherein the retrieval device is configured such that sufficient longitudinal movement of the emboli capturing device toward the mesh sleeve causes the emboli capturing device to drive the second end of the mesh sleeve toward the first end of the mesh sleeve.

10. The emboli capturing system of claim 9 wherein the mesh sleeve is sized to encompass at least the mouth of the emboli capturing device as the mesh sleeve moves from the radially expanded position to the collapsed position.

11. The emboli capturing system of claim 2 wherein the retrieval device includes:

a third elongate member having proximal and distal ends and a lumen extending therebetween, the lumen being sized to

slidably receive at least a portion of the first elongate member;

a fourth elongate member longitudinally movable relative to the third elongate member; and

a mesh sleeve having a first end coupled to the third elongate member and a second end coupled to the fourth elongate member and an intermediate portion between the first and second ends, the mesh sleeve being configured such that relative longitudinal movement of one of the third and fourth elongate members relative to another of the third and fourth elongate members drives movement of the mesh portion from a radially retracted position, to a radially expanded position in which the intermediate portion expands radially outward relative to the first and second ends, and to a collapsed position in which the mesh sleeve bends such that the intermediate portion is displaced in a direction toward one of the first and second ends of the mesh sleeve.

12. The emboli capturing system of claim 1 wherein the receiving end of the delivery device is defined by a portion of a dilatation balloon.

13. The emboli capturing system of claim 1 wherein the receiving end of the delivery device is thermally shrunk over at least the mouth of the emboli capturing

device to retain the emboli capturing device in the radially contracted position during delivery.

14. The emboli capturing system of claim 1 wherein the receiving end of the delivery device is movable from the radially retracted position to the radially expanded position by delivery of pressurized fluid through the lumen in the second elongate member.

15. The emboli capturing system of claim 1 wherein the emboli capturing device is a self-expanding device biased in the radially expanded position.

16. The emboli capturing system of claim 15 wherein the emboli capturing device includes:

a frame formed of a shape memory alloy; and  
a filter portion supported by the frame, the filter portion being configured to permit blood flow therethrough and to capture emboli carried by blood flow therethrough.

17. The emboli capturing system of claim 16 wherein the filter portion has a first end connected to the first elongate member and a second end connected to the frame and wherein the frame comprises:

a loop disposed about the first elongate member to define the mouth of the emboli capturing device.

18. The emboli capturing system of claim 17 wherein the loop is directly connected to the first elongate member.

19. The emboli capturing system of claim 17 wherein the shape memory alloy comprises an alloy having superelastic properties.

20. The emboli capturing system of claim 19 wherein the shape memory alloy includes nitinol.

21. The emboli capturing system of claim 20 wherein the emboli capturing device is substantially conical in shape.

22. The emboli capturing system of claim 21 wherein the filter portion comprises a polyurethane member having a plurality of holes therein.

23. The emboli capturing system of claim 1 wherein the first elongate member comprises a guidewire.

24. A method of capturing emboli carried by flow of fluid through a body lumen, the method comprising:  
providing a first elongate member having a proximal end and a distal end;  
providing an expandable emboli capturing device mounted proximate the distal end of the first elongate member, the emboli capturing device being movable between a radially expanded position and a radially retracted position, the expandable emboli capturing device defining a proximally opening mouth when in the radially expanded position;  
providing a second elongate member having a proximal end and a distal end and a lumen extending between the proximal and

distal ends, the lumen being sized to slidably receive a portion of the first elongate member therein;

providing an expandable delivery device mounted to the distal end of the second elongate member and being movable from a radially retracted position to a radially expanded position, the delivery device having a receiving end configured to receive the emboli capturing device, the delivery device retaining at least the mouth of the emboli capturing device in the radially retracted position when the delivery device is in the radially retracted position;

inserting the expandable delivery device into the lumen with the mouth of the emboli capturing device retained in the radially retracted position within the delivery device;

expanding the expandable delivery device into the radially expanded position; and

longitudinally moving the delivery device relative to the emboli capturing device to remove the emboli capturing device from within the delivery device.

25. The method of claim 24 and further comprising:

providing a retrieval device, configured to be longitudinally movable relative to the emboli capturing device in the body lumen and having a receiving end configured to receive at least the mouth



of the emboli capturing device when the emboli capturing device is in the radially expanded position; and longitudinally moving the delivery device relative to the emboli capturing device such that at least the mouth of the emboli capturing device is in the receiving end of the retrieval device.

26. The method of claim 25 wherein the receiving end of the retrieval device is contractible from a radially expanded position to a radially contracted position, and further comprising:

contracting the receiving end of the retrieval device to at least partially collapse the emboli capturing device therein.

27. The method of claim 26 wherein providing a retrieval device comprises:

providing a third elongate member having proximal and distal ends and a lumen extending therebetween, the lumen being sized to slidably receive at least a portion of the first elongate member therein, the lumen at the distal end of the third elongate member forming the receiving end and being sized to receive a most radially expanded portion of the emboli capturing device;

providing a fourth elongate member movable within the lumen of the third elongate member, the fourth elongate member having an intermediate region sized to

substantially fill the receiving end and a distal tip having an outer diameter less than an outer diameter of the intermediate region;

advancing the third and fourth elongate members over the first elongate member, with the intermediate region of the fourth elongate member positioned within the third elongate member to fill the receiving end thereof, to a point proximate the emboli capturing device; withdrawing the distal tip of the fourth elongate member within the lumen of the third elongate member; and positioning at least the mouth of the emboli capturing device within the receiving end of the retrieval device.

28. The method of claim 27 and further comprising: withdrawing the first, third, and fourth elongate members from the body lumen.

29. The method of claim 25 wherein providing the retrieval device includes:

providing a third elongate member having proximal and distal ends and a lumen extending therebetween, the lumen being sized to slidably receive at least a portion of the first elongate member; providing a mesh sleeve having a first end coupled to the third elongate member, a second end distal of the first end and an intermediate portion between the first and second ends, the mesh sleeve

being configured such that relative longitudinal movement of one of the first and second ends thereof relative to another of the first and second ends thereof drives movement of the mesh portion from a radially retracted position, to a radially expanded position in which the intermediate portion expands radially outward relative to the first and second ends, and to a collapsed position in which the mesh sleeve bends such that the intermediate portion is displaced in a direction toward one of the first and second ends of the mesh sleeve;

advancing the third elongate member into the body lumen over the first elongate member to a point proximate the mouth of the emboli capturing device; and

accomplishing relative longitudinal movement of the emboli capturing device and the mesh sleeve toward one another, driving the second end of the mesh sleeve toward the first end of the mesh sleeve such that the mesh sleeve encompasses at least the mouth of the emboli capturing device as the mesh sleeve moves from the radially expanded position to the collapsed position.

30. The method of claim 24 wherein expanding comprises:

delivering pressurized fluid through the lumen in the second elongate member.